In the name of God

Urolithiasis in pregnancy

PROFESSOR DR.BANDARIAN

PRESENT BY : MOHAMMAD JAMSHIDOF

GYNECOLOGY WARD

ZIAEIAN HOSPITAL

WINTER ۱۳۹۶

International Journal of Surgery 36 (2016) 688–692

Contents lists available at ScienceDirect

International Journal of Surgery

journal homepage: www.journal-surgery.net

Review

Urolithiasis in pregnancy

Renato N. Pedro [a, b, 1], Krishanu Das [a, c, 1], Noor Buchholz [a, *]

[a] U-merge (Urology in Emerging Countries), London, UK
[b] Faculdade Medicina Sao Leopoldo Mandic, Brazil
[c] Royal Endourology & Robotic Fellow Adelaide Hospital, Australia

Method and Materials

- electronic literature search
  - bibliographic database- PubMed (Medline)
  - Ovid
  - eMedicine(WebMD)
- ۴۶ Articles

Method and Materials

- Keywords
  - hydronephrosis
  - urolithiasis
  - kidney stone
  - urinary tract infection
  - pregnancy
  - ultrasound
  - incidence and epidemiology of renal stones

Intoduction

- Most common cause of urological-related abdominal pain in pregnant women
- Associated with:
  - Ureteral obstruction
  - upper urinary tract infection
  - urosepsis
  - perinephric abscess

Introduction

- May initiate premature labouror interfere with the progression
- may mimic other acute conditions such as:
  - appendicitis
  - diverticulitis
  - placental abruption

Introduction

- Limits:
  - adverse effects with usage of anaesthesia
  - radiation
  - medications
  - surgery on mother and foetus

Introduction

- During Pregnancy:
  - physiological and anatomical changes that may promote lithogenesis
  - biochemical parameters
  - hormonal dynamics

Epidemiology

- Incidence :
  - ١:١٨٨ to ١:٤٦٠٠
- usually manifest during the third to fifth decades of life, with an average age of ٢٤,٦ years
- a global rise in incidence of urolithiasis in women

Epidemiology

- The incidence of symptomatic nephrolithiasis complicating pregnancy has been reported as ١ in ٣٣٠٠ pregnancies
- increased prevalence of urolithiasis in industrialised nations
- Multiparous women are more commonly affected
- ٨٠-٩٠% of affected women experience symptoms during the second or third trimester

Epidemiology

- Both kidneys and both ureters can be equally affected
- at presentation, calculi are more commonly located in the ureter than the renal pelvis or calyx
- Recurrence of renal calculi has been recorded in ۲۵% pregnant patients

Epidemiology

- Younger Women:
  - Protective:
    - dietary calcium, phytate and fluid intake
  - Increased the risk
    - animal protein and sucrose

Epidemiology

- In Older adults:
  - no association between dietary calcium and calculi development
  - **Increased:**
    - total vitamin C intake
  - **Decreased:**
    - magnesium, potassium and fluid intake

Epidemiology

- similar risk factors as in non-pregnant women :
  - Increasing age
  - positive family history
  - Decreased water intake
  - hot & dry climate
  - diet rich in calcium, sodium, and red meat
  - Obesity
  - Diabetes

Pathophysiology

- ٨٠% of kidney calculi are calcium lithiasis
  - calcium oxalate(CaOx) calculi are more frequent than calcium phosphate (CaP)
  - ٧٤% vs ٢٦%
- Uric acid(UA ٩%)
- Struvite calculi (١٠%)
- Rare: (١%)
  - Cystine
  - Drug calculi
  - Common acid urate

Pathophysiology

- Complex cascade
  - supersaturated with calculi-forming salts
  - lack of inhibitors of calculi formation
  - retention of crystals or nuclei

Pathophysiology

- Hyperoxaluria
  - secondary to deranged oxalate synthesis
  - increased intestinal oxalate absorption
  - high oxalate-low calcium diet
  - Altered colonic flora
  - abnormal anion transport in gut and kidney

Pathophysiology

- Uric acid stones
  - low urine volume, acidic urine pH, and hyperuricosuria
  - Idiopathic
  - Inborn error of metabolism
  - secondary causes such as chronic diarrhea,strenuous physical exercise, and a high purine diet

Changes in pregnancy

- **Gestational hydronephrosis**
  - in ٩٠% of pregnant women beginning from ٦ to ١١ weeks
  - Resolving by ٤e٦ weeks after delivery
  - Both hormonal and mechanical factors
  - High levels of serum progesterone cause relaxation of the ureteric smooth muscles
  - mechanical compression of the ureters by the gravid uterus
- **Physiological dilatation leads to urinary stasis and promotes crystallization**
- **increased renal pelvic pressure**

Changes in pregnancy

- **(GFR) and renal plasma flow (RPF) are both increased by ٢٠e٢٥%**
  - increased cardiac output
  - decreased systemic vascular resistance
  - increased levels of circulating natriuretic hormones like progesterone, aldosterone, deoxycortisone, and human chorionic gonadotrophin
  - Raised urinary excretion of osmotically active metabolites like glucose,amino acids, proteins, and vitamins
- **Augmented urinary excretion of urolithiasis inhibitors such as citrate, magnesium and glycoproteins**

Changes in pregnancy

- **Hemodynamic alterations**
  - increased filtered loads of calcium, sodium, and uric acid
- **absorptive hypercalciuria and serum oxalate supersaturation**

Infectious calculi in pregnancy

- urea-splitting organisms (e.g. Proteus species)
- usually composed of pure magnesium ammonium phosphate
- more commonly noted in the presence of a congenital abnormality

Infectious calculi in pregnancy

- Stones due to infection have clearly declined over the years
- Occurrence of struvite calculi has been reported following usage of magnesium sulfate tocolysis

Metabolic syndrome and renal calculi

- Metabolic syndrome
  - centrally distributed obesity
  - hypertension
  - dyslipidemia
  - Hyperglycemia

Metabolic syndrome and renal calculi

- A higher prevalence of renal lithiasis has been reported in patients suffering from three or more traits of metabolic syndrome

- a high prevalence of Metabolic Syndrome features has been reported in patients suffering from idiopathic uric acid lithiasis

Metabolic syndrome and renal calculi

- those with gestational diabetes mellitus, have a higher risk of developing metabolic syndrome postpartum and associated renal calculi

- Preventive measures:
  - dietary modification
  - lifestyle changes
  - control of diabetes and dyslipidemia
  - Weight loss

Diagnosis of stones in pregnancy

- Renal and bladder ultrasonography (US KUB) is recommended as first line option
- Transvaginal ultrasonography can add important information
  - better evaluates the distal ureter and ureteral-vesical-junction

Diagnosis of stones in pregnancy

- Plain X-ray (X-KUB) and intravenous urography are to date less used
  - may play an adjunctive role
- CT scans are avoided in pregnant women due to the high X-ray emission and its potential teratogenic effects (particularly in the first trimester)
  - use of low dose CT scan protocols that expose the fetus to lower radiation doses and maintain diagnostic accuracy, can be an option
- non-contrast magnetic resonance urography (HASTE protocol)

Conservative management of urolithiasis in pregnancy

- multidisciplinary approach
  - urologist
  - obstetrician
  - radiologist
  - neonatologist
  - anesthesiologist

Conservative management of urolithiasis in pregnancy

- adequate pain control
- avoid dehydration
- oral hydration preferred ,analgesics, anti-emetics (if indicated) and antibiotics (if infection is present)

Conservative management of urolithiasis in pregnancy

- Pain management
  - acetaminophen with codeine, hydrocodone, or oxycodone
  - Nonsteroidal anti-inflammatory medications should be avoided
- intravenous pain medications can be used. Morphine sulfate, hydromorphone, butorphanol, meperidine, and acetaminophen
- patient-controlled analgesia pump
- epidural infusion of narcotics may be necessary

Conservative management of urolithiasis in pregnancy

- Medical expulsive therapy (MET)
  - alpha-adrenoreceptor blockers may facilitate expulsion of ureteral calculi by promoting relaxation of ureteral smooth muscle
- more aggressive treatment should be made on a case-by-case basis
  - The presence of an infected hydronephrosis, particularly in the face of impaired renal function, and urosepsis require immediate surgical intervention

Conservative management of urolithiasis in pregnancy

- Dietary modifications
  - improved hydration
  - herbal tea to lower urinary oxalate excretion
  - reduced consumption of oxalate rich foods
  - reduction of methionine and salt intake
  - Use of fish oils in the diet
  - avoid excessive calcium(including calcium-fortified prenatal vitamins), sodium and protein intake

Conservative management of urolithiasis in pregnancy

- Thiazide diuretics are contraindicated
- prevention of uric acid lithiasis in pregnancy
  - increased fluid intake
  - restricted dietary purine intake
  - urinary alkalinization
  - Xanthine oxidase inhibitors are contraindicated

Conservative management of urolithiasis in pregnancy

- Cystinuria and cysteine lithiasis
  - Increasing urinary volume
  - Urine alkalinization
  - Penicillamine and Alpha-mercaptopropionyl glycine(alpha-MPG) are contraindicated

Surgical treatments

- Recommended in:
  - uncontrollable pain
  - persistent vomiting
  - Fever
  - Obstetric complications
  - Solitary kidney
  - bilateral ureteral stones
  - ureteral stones bigger than ١ cm
  - worsening of clinical settings

Surgical treatments

- Renal drainage
  - **only indicated when definitive surgical treatment is not advisable or available**
  - **May be indicated in:**
    - ✓ active infection
    - ✓ large or bilateral stones
    - ✓ Abnormal anatomy
    - ✓ obstetric complications
    - ✓ insufficient multidisciplinary support and/or scant endourological or anesthetic resources available
  - **double J catheter and nephrostomy tube are equally effective**

Surgical treatments

- Definitive stone treatment
  - For pregnant woman with no signs of either infection, obstetric complications, intricate stone scenarios, or whose pregnancy has passed the first trimester
  - Ureterorenoscopy (URS) has become the primary option
  - alternative treatments, namely shock wave lithotripsy (SWL) and percutaneous nephrolithotomy (PCNL) are contraindicated

Thank you for your attention